

14 FEB. 2001

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY**PCT**

To:

Bryns Patentkontor A/S
Langfeldt, Jens F.C.
P.O. Box 765, Sentrum
N-0106 OsloNOTIFICATION OF RECEIPT
OF DEMAND BY COMPETENT INTERNATIONAL
PRELIMINARY EXAMINING AUTHORITY(PCT Rules 59.3(e) and 61.1(b), first sentence
and Administrative Instructions, Section 601(a))Date of mailing
(day/month/year)

12-02-2001

Applicant's or agent's file reference

E14443 JFL/JB

IMPORTANT NOTIFICATION

International application No.

PCT/NO00/00235

International filing date (day/month/year)

10-07-2000

Priority date (day/month/year)

13-07-1999

Applicant

Metronor ASA
et al

1. The applicant is hereby notified that this International Preliminary Examining Authority considers the following date as the date of receipt of the demand for international preliminary examination of the international application:

12-02-2001

2. This date of receipt is:

- ☒ the actual date of receipt of the demand by this Authority (Rule 61.1(b)).
- ☐ the actual date of receipt of the demand on behalf of this Authority (Rule 59.3(e)).
- ☐ the date on which this Authority has, in response to the invitation to correct defects in the demand (Form PCT/IPEA/404), received the required corrections.

3. ☐ **ATTENTION:** That date of receipt is **AFTER** the expiration of 19 months from the priority date. Consequently, the election(s) made in the demand does (do) not have the effect of postponing the entry into the national phase until 30 months from the priority date (or later in some Offices) (Article 39(1)). Therefore, the acts for entry into the national phase must be performed within 20 months from the priority date (or later in some Offices) (Article 22). For details, see the *PCT Applicant's Guide*, Volume II.

- ☐ (If applicable) This notification confirms the information given by telephone, facsimile transmission or in person on:

4. Only where paragraph 3 applies, a copy of this notification has been sent to the International Bureau.

Name and mailing address of the IPEA/

Patent- och registreringsverket
Box 5055
S-102 42 STOCKHOLM
Facsimile No. 08-667 72 88Telex
17978
PATOREG-S

Authorized officer

Telephone No. 08-782 25 00

Jan-Erik Karlsson

27 AUG. 2001

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

BRYNS PATENTKONTOR A/S
LANGFELDT, JENS F.C.
P.O. Box 765, Sentrum
N-0106 OSLO

PCT

WRITTEN OPINION

(PCT Rule 66)

Date of mailing
(day/month/year)

24-08-2001

Applicant's or agent's file reference

E14443 JFL/JB

REPLY DUE

within 45 days
from the above date of mailing

International application No.

PCT/NO00/00235

International filing date (day/month/year)

10-07-2000

Priority date (day/month/year)

13-07-1999

International Patent Classification (IPC) or both national classification and IPC⁷

G01B 11/03, G01B 11/24

Applicant

METRONOR ASA et al.

1. This written opinion is the FIRST (first, etc.) drawn by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

3. The applicant is hereby **invited to reply** to this opinion.

When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4bis.
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 13-11-2001

Name and mailing address of the IPEA/SE

Patent- och registreringsverket
Box 5055
S-102 42 STOCKHOLM

Facsimile No. 08-667 72 88

Telex
17978

PATOREG-S

Authorized officer

Göran Magnusson /itw

Telephone No. 08-782 25 00

I. Basis of the opinion**1. With regard to the elements of the international application:***

- ☒ the international application as originally filed
- ☐ the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the claims:
pages _____, as originally filed
pages _____, as amended (together with any statement) under article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the drawings:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language english which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☒ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the written opinion was drawn on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheet/fig _____

5. ☐ This opinion has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed".

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1-10</u>	YES
	Claims	<u>11-13</u>	NO
Inventive step (IS)	Claims		YES
	Claims	<u>1-10</u>	NO
Industrial applicability (IA)	Claims	<u>1-13</u>	YES
	Claims		NO

2. Citations and explanations

The following documents were cited in the international search report:

D1 : US 5912739 A
D2 : DE 4325269 A1
D3 : EP 0427692 A2
D4 : WO 9610205 A1
D5 : US 5841539 A

However, D6: WO 9804881 A1 (corresponding to NO 303595, cited in the application), is considered to represent the closest prior art.

D6 discloses a sensor unit for point by point detection of surface geometry and a position measuring unit to determine the position of the sensor unit in relation to a network of reference points in known positions relative to a global coordinate system. The sensor unit is moved by a robot and uses mechanical scanning by a contact probe.

The expression "the scanner unit (2)" in the independent claims 11 and 13 is unclear and does not restrict the claims to optical scanning. Therefore, the invention claimed in claims 11-13 is known from D6.

The invention claimed in claim 1 differs from the system known from D6 in the use of optical scanning for non-touch probing instead of mechanical scanning by a contact probe. However, D1 discloses a movable sensor unit, comprising an optical scanner and a positioning unit to correlate data from successive scans. It is considered obvious to a person skilled in the art to combine the principle parts of document D1 with the closest prior art document D6 to obtain the features of claim 1. Therefore, the invention claimed in claim 1 is not considered to involve an inventive step.

... / ...

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: V

In view of the cited documents D1 and D6, remaining claims 2-10 are matters of fact, which are previously known. Therefore, the invention claimed in dependent claims 2-10 is not considered to involve an inventive step.

Documents D2-D5 disclose the state of the art.

To sum up, the invention claimed in claims 11-13 lacks novelty (N), the invention claimed in claims 1-10 does not involve an inventive step (IS) and all claims 1-13 have industrial applicability (IA),

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 31 OCT 2001

WIPO PCT

Applicant's or agent's file reference E14443 JFL/JB	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/NO00/00235	International filing date (day/month/year) 10-07-2000	Priority date (day/month/year) 13-07-1999
International Patent Classification (IPC) or national classification and IPC ₇ G01B 11/03, G01B 11/24		
Applicant METRONOR ASA et al.		

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 3 sheets.

- This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 12-02-2001	Date of completion of this report 23-10-2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer Göran Magnusson /itw Telephone No. 08-782 25 00

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/NO00/00235

I. Basis of the report

1. With regard to the **elements** of the international application:*☐ the international application as originally filed☒ the description:pages 1-4, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

☒ the claims:

pages _____, as originally filed

pages _____, as amended (together with any statement) under article 19

pages _____, filed with the demand

pages 5-7, filed with the letter of 2001-10-08☒ the drawings:pages 1-2, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

☐ the sequence listing part of the description:

pages _____, as originally filed

pages _____, filed with the demand

pages _____, filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).☐ the language of publication of the international application (under Rule 48.3(b)).☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:☐ contained in the international application in written form.☐ filed together with the international application in computer readable form.☐ furnished subsequently to this Authority in written form.☐ furnished subsequently to this Authority in computer readable form.☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.4. ☐ The amendments have resulted in the cancellation of:☐ the description, pages _____☐ the claims, Nos. _____☐ the drawings, sheet/fig _____5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/NO00/00235

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims	<u>1-12</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-12</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-12</u>	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The following documents were cited in the international search report:

D1 : US 5912739 A
D2 : DE 4325269 A1
D3 : EP 0427692 A2
D4 : WO 9610205 A1
D5 : US 5841539 A

Documents D1 and WO 9804881 A1 (corresponding to NO 303595, cited in the application) are considered to represent the closest prior art.

D1 discloses a movable sensor unit, comprising an optical scanner and a positioning unit to correlate data from successive scans.

WO 9804881 A1 discloses a sensor unit for point by point detection of surface geometry and a position measuring unit to determine the position of the sensor unit in relation to a network of reference points in known positions relative to a global coordinate system. The sensor unit is moved by a robot and uses mechanical scanning by a contact probe.

However, the claims have been amended. New claim 1 is a combination of original claims 1 and 3. New independent claims 10 and 12 have been restricted to optical scanning.

The invention defined in amended claims 1-12 is not disclosed by any of these documents.

... / ...

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

None of the documents gives any indication towards the claimed method for detection of the surface geometry of an object and for calibration a sensor unit. No relevant combination of the documents would lead a person skilled in the art to the invention defined in the claims.

Therefore, the invention defined in amended claims 1-12 is novel and is considered to involve an inventive step. It is also considered to be industrially applicable.

2000-07-10

PCT/NO 00/00235

417000



PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only	
PCT/NO 00 / 00235	
International Application No.	
2000-07-10 (10.07.00)	
International Filing Date	
Name of receiving Office and "PCT International Application"	
Applicant's or agent's file reference (if desired) (12 characters maximum) E14443 JFL/JB	

Box No. I TITLE OF INVENTION	
SYSTEM FOR SCANNING OF THE GEOMETRY OF LARGE OBJECTS	
Box No. II APPLICANT	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	
Metronor ASA Fekjan 13 N-1394 NESBRU, NORWAY	
<input type="checkbox"/> This person is also inventor.	
Telephone No. 66983800	
Facsimile No. 66983801	
Teleprinter No.	
State (that is, country) of nationality: NORWAY	State (that is, country) of residence: NORWAY
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input checked="" type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	
PETTERSEN, Alf Ing. Hoels vei 26 N-1346 GJETTUM, NORWAY	
This person is: <input type="checkbox"/> applicant only <input checked="" type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (if this check-box is marked, do not fill in below.)	
State (that is, country) of nationality: NORWAY	State (that is, country) of residence: NORWAY
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box	
<input type="checkbox"/> Further applicants and/or (further) inventors are indicated on a continuation sheet.	
Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE	
The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: <input checked="" type="checkbox"/> agent <input type="checkbox"/> common representative	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)	
LANGFELDT, Jens F.C. BRYNS PATENTKONTOR A/S P.O. Box 765; Sentrum N-0106 OSLO, NORWAY	
Telephone No. 22910400	
Facsimile No. 22910500	
Teleprinter No.	
<input type="checkbox"/> Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.	

Box No.V DESIGNATION OF STATES	
The following designations are hereby made under Rule 4.9(a) <i>(mark the applicable check-boxes; at least one must be marked)</i> :	
Regional Patent	
<input checked="" type="checkbox"/> AP	ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, MZ Mozambique, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
<input checked="" type="checkbox"/> EA	Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
<input checked="" type="checkbox"/> EP	European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
<input checked="" type="checkbox"/> OA	OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT <i>(if other kind of protection or treatment desired, specify on dotted line)</i>
National Patent <i>(if other kind of protection or treatment desired, specify on dotted line)</i>	
<input checked="" type="checkbox"/> AE	United Arab Emirates
<input checked="" type="checkbox"/> AG	Antigua and Barbuda
<input checked="" type="checkbox"/> AL	Albania
<input checked="" type="checkbox"/> AM	Armenia
<input checked="" type="checkbox"/> AT	Austria
<input checked="" type="checkbox"/> AU	Australia
<input checked="" type="checkbox"/> AZ	Azerbaijan
<input checked="" type="checkbox"/> BA	Bosnia and Herzegovina
<input checked="" type="checkbox"/> BB	Barbados
<input checked="" type="checkbox"/> BG	Bulgaria
<input checked="" type="checkbox"/> BR	Brazil
<input checked="" type="checkbox"/> BY	Belarus
<input checked="" type="checkbox"/> BZ	Belize
<input checked="" type="checkbox"/> CA	Canada
<input checked="" type="checkbox"/> CH and LI	Switzerland and Liechtenstein
<input checked="" type="checkbox"/> CN	China
<input checked="" type="checkbox"/> CR	Costa Rica
<input checked="" type="checkbox"/> CU	Cuba
<input checked="" type="checkbox"/> CZ	Czech Republic
<input checked="" type="checkbox"/> DE	Germany
<input checked="" type="checkbox"/> DK	Denmark
<input checked="" type="checkbox"/> DM	Dominica
<input checked="" type="checkbox"/> DZ	Algeria
<input checked="" type="checkbox"/> EE	Estonia
<input checked="" type="checkbox"/> ES	Spain
<input checked="" type="checkbox"/> FI	Finland
<input checked="" type="checkbox"/> GB	United Kingdom
<input checked="" type="checkbox"/> GD	Grenada
<input checked="" type="checkbox"/> GE	Georgia
<input checked="" type="checkbox"/> GH	Ghana
<input checked="" type="checkbox"/> GM	Gambia
<input checked="" type="checkbox"/> HR	Croatia
<input checked="" type="checkbox"/> HU	Hungary
<input checked="" type="checkbox"/> ID	Indonesia
<input checked="" type="checkbox"/> IL	Israel
<input checked="" type="checkbox"/> IN	India
<input checked="" type="checkbox"/> IS	Iceland
<input checked="" type="checkbox"/> JP	Japan
<input checked="" type="checkbox"/> KE	Kenya
<input checked="" type="checkbox"/> KG	Kyrgyzstan
<input checked="" type="checkbox"/> KP	Democratic People's Republic of Korea
<input checked="" type="checkbox"/> KR	Republic of Korea
<input checked="" type="checkbox"/> KZ	Kazakhstan
<input checked="" type="checkbox"/> LC	Saint Lucia
<input checked="" type="checkbox"/> LK	Sri Lanka
<input checked="" type="checkbox"/> LR	Liberia
<input checked="" type="checkbox"/> LS	Lesotho
<input checked="" type="checkbox"/> LT	Lithuania
<input checked="" type="checkbox"/> LU	Luxembourg
<input checked="" type="checkbox"/> LV	Latvia
<input checked="" type="checkbox"/> MA	Morocco
<input checked="" type="checkbox"/> MD	Republic of Moldova
<input checked="" type="checkbox"/> MG	Madagascar
<input checked="" type="checkbox"/> MK	The former Yugoslav Republic of Macedonia
<input checked="" type="checkbox"/> MN	Mongolia
<input checked="" type="checkbox"/> MW	Malawi
<input checked="" type="checkbox"/> MX	Mexico
<input checked="" type="checkbox"/> MZ	Mozambique
<input checked="" type="checkbox"/> NO	Norway
<input checked="" type="checkbox"/> NZ	New Zealand
<input checked="" type="checkbox"/> PL	Poland
<input checked="" type="checkbox"/> PT	Portugal
<input checked="" type="checkbox"/> RO	Romania
<input checked="" type="checkbox"/> RU	Russian Federation
<input checked="" type="checkbox"/> SD	Sudan
<input checked="" type="checkbox"/> SE	Sweden
<input checked="" type="checkbox"/> SG	Singapore
<input checked="" type="checkbox"/> SI	Slovenia
<input checked="" type="checkbox"/> SK	Slovakia
<input checked="" type="checkbox"/> SL	Sierra Leone
<input checked="" type="checkbox"/> TJ	Tajikistan
<input checked="" type="checkbox"/> TM	Turkmenistan
<input checked="" type="checkbox"/> TR	Turkey
<input checked="" type="checkbox"/> TT	Trinidad and Tobago
<input checked="" type="checkbox"/> TZ	United Republic of Tanzania
<input checked="" type="checkbox"/> UA	Ukraine
<input checked="" type="checkbox"/> UG	Uganda
<input checked="" type="checkbox"/> US	United States of America
<input checked="" type="checkbox"/> UZ	Uzbekistan
<input checked="" type="checkbox"/> VN	Viet Nam
<input checked="" type="checkbox"/> YU	Yugoslavia
<input checked="" type="checkbox"/> ZA	South Africa
<input checked="" type="checkbox"/> ZW	Zimbabwe
<input type="checkbox"/>	Check-box reserved for designating States which have become party to the PCT after issuance of this sheet:
Precautionary Designation Statement: In addition to the designations made above the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn the applicant at the expiration of that time limit. <i>(Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)</i>	

Sheet No. 3

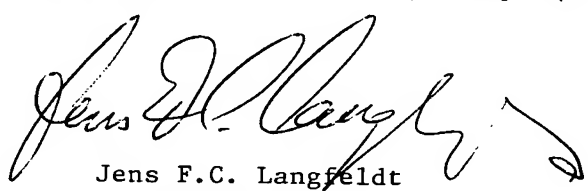
Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application: regional Office	international application: receiving Office
item (1) (13.07.99) 13 July 1999	19993446	NORWAY		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office identified above as item(s) 1)

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY			
Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):		Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):	
ISA / SE		Date (day/month/year)	Number Country (or regional Office)

Box No. VIII CHECK LIST; LANGUAGE OF FILING	
This international application contains the following number of sheets: request : 3 description (excluding sequence listing part) : 4 claims : 3 abstract : 1 drawings : 2 sequence listing part of description : Total number of sheets : 13	This international application is accompanied by the item(s) marked below: 1. <input checked="" type="checkbox"/> fee calculation sheet 2. <input checked="" type="checkbox"/> separate signed power of attorney 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: 4. <input type="checkbox"/> statement explaining lack of signature 5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s): 6. <input type="checkbox"/> translation of international application into (language): 7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material 8. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form 9. <input checked="" type="checkbox"/> other (specify): Copy of Official Action
Figure of the drawings which should accompany the abstract: 1	Language of filing of the international application: Norwegian

Box No. IX SIGNATURE OF APPLICANT OR AGENT	
Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).	
 Jens F.C. Langfeldt patent agent	

For receiving Office use only		2. Drawings: <input checked="" type="checkbox"/> received: <input type="checkbox"/> not received:
1. Date of actual receipt of the purported international application:	2000-07-10 (10.07.00)	
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		
5. International Searching Authority (if two or more are competent): ISA / SE	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.	

For International Bureau use only	
Date of receipt of the record copy by the International Bureau:	12 OCTOBER 2000 (12.10.00)

Fig.1.

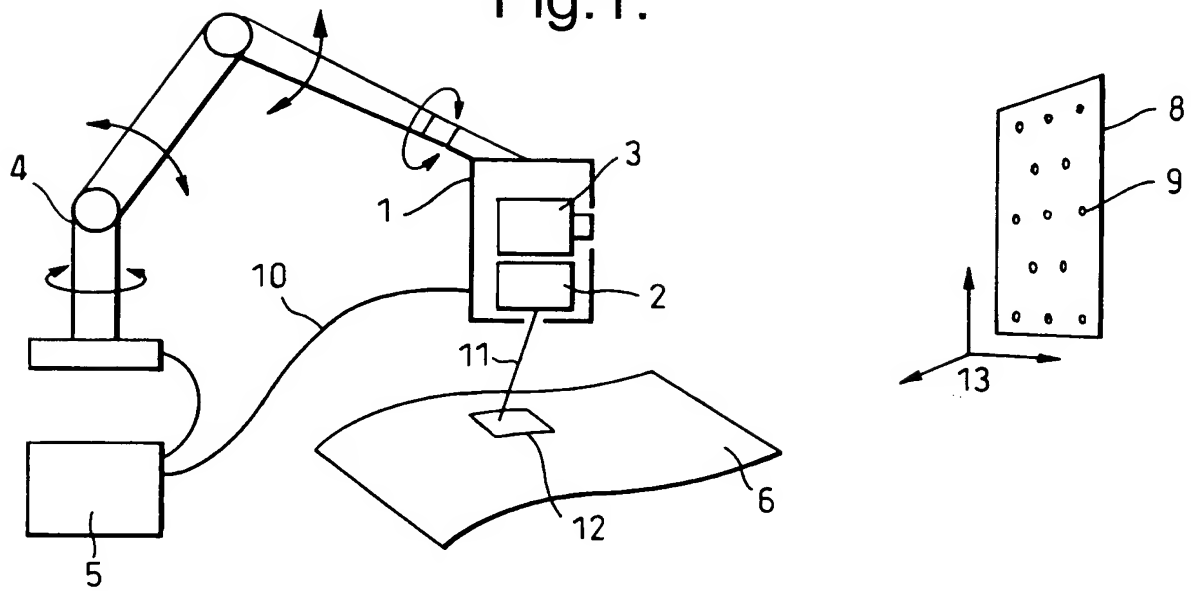
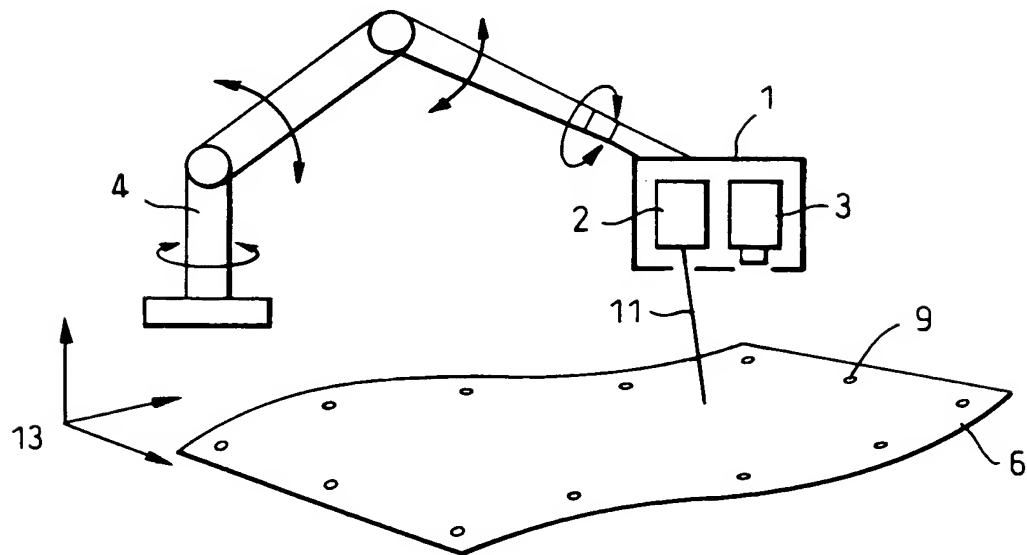


Fig.2.



2/2

Fig.3.

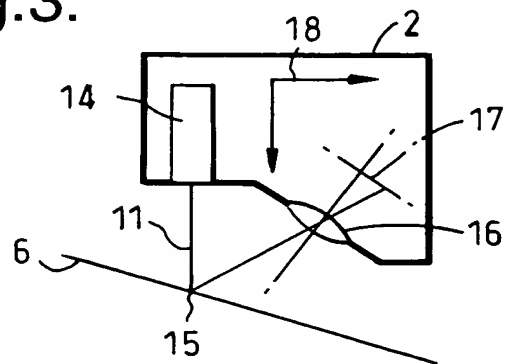


Fig.4.

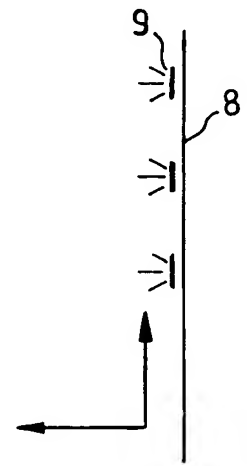
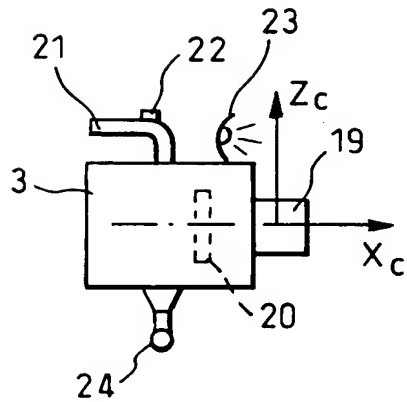
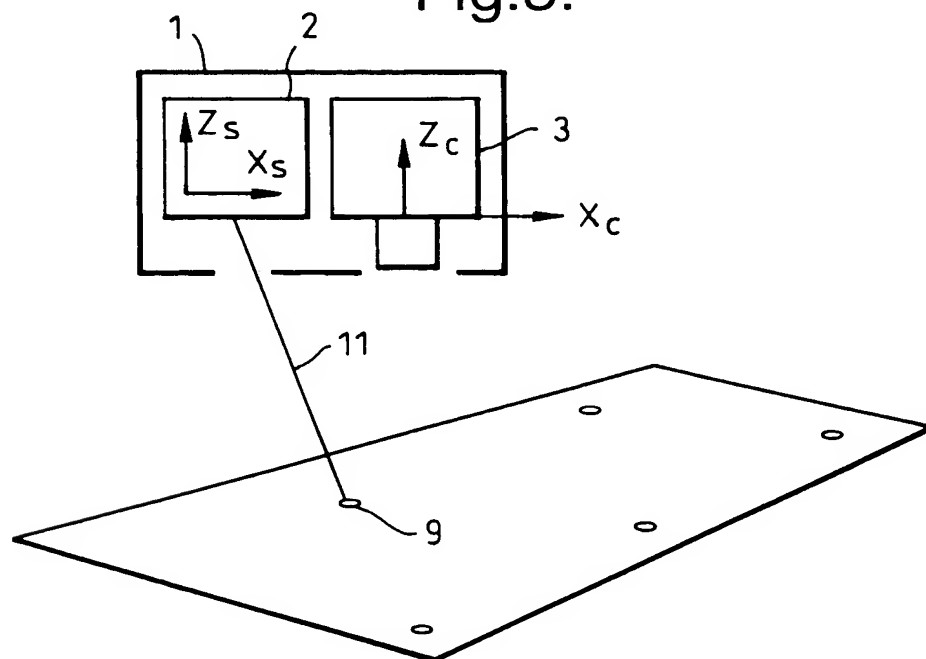


Fig.5.



SYSTEM FOR SCANNING AV STORE OBJEKTERS GEOMETRI

Den foreliggende oppfinnelse vedrører et system samt en fremgangsmåte for scanning av objekters geometri, slik som angitt i ingressen av krav 1 og 11.

5

Det finnes en rekke laserbaserte scannere for oppmåling av flater. Karakteristisk for disse er at de har begrenset arbeidsområde, eller begrenset målevolum, må posisjoneres i en gitt avstand fra flaten, og bør ha en gitt orientering relativt til flaten. Scannere monteres derfor ofte på nøyaktige koordinatmålemaskiner, slik at scanneren
10 kan forflyttes stegvis over flaten og scanne område for område. En koordinatmåle-maskin er kompleks, lite fleksibel og har høy pris.

Det er behov for mer fleksible, flyttbare løsninger. Et alternativ er å montere en scanner på en robot, slik at roboten forflytter scanneren over objektet. For hver
15 posisjon scannes en delflate. Denne oppmålingen registreres relativt til scannerens posisjon, og transformeres til et globalt koordinatsystem gitt av roboten.

De fleste roboter har imidlertid en dårlig nøyaktighet. Transformasjon av dataene til robotens koordinatsystem vil derfor ikke gi en tilstrekkelig nøyaktig beskrivelse av
20 objektets overordnede geometri. Kalibrering av roboten for å beskrive dens bevegelser bedre vil hjelpe noe, men på grunn av effekter som slitasje og temperaturvariasjoner er heller ikke dette godt nok.

I den foreliggende oppfinnelse kombineres en løsning bestående av robot og scanner
25 med bruk av en posisjonsmåleenhet som beskrevet i norsk patent nr. 303.595. Scanneren og posisjonsmåleenheten integreres i en sensorenhet. I denne løsningen gir posisjonsmåleenheten informasjonen om scannerens eksakte posisjon. Roboten benyttes kun til forflytning av sensorenheten.

30 De for oppfinnelsen kjennetegnende trekk ved henholdsvis systemet og fremgangsmåten fremgår av den kjennetegnende del av henholdsvis vedlagte krav 1 og 11. Ytterligere utførelsesformer fremgår av underkravene.

Figur 1 viser systemløsningen.

35

Figur 2 viser en alternativ konfigurasjon.

Figur 3 viser et eksempel på en scannerenhet, en trianguleringssensor.

Figur 4 viser et eksempel på en posisjonsmåleenhet som beskrevet i norsk patent nr. 303.595.

- 5 Figur 5 viser en metode for å bestemme den interne geometrien i sensorenheten.

Figur 1 viser et eksempel på en konfigurasjon av systemet. Dette består i hovedsak av to enheter, en sensor 1 og en robot 4. Roboten benyttes for å posisjonere sensoren ved det aktuelle område 12 på objektet 6. Sensoren 1 registrerer objektets lokale geometri, og måler sin egen posisjon relativt til et globalt koordinatsystem 13.

Sensorenheten 1 består av en scannerenhet 2 for lokal scanning av geometri samt posisjonsmåleenhet 3 for å bestemme sensorenhetens egen posisjon relativt til det globale koordinatsystem 13. Scannerenheten 2, eksempelvis en laser scanner, emitterer en laserstråle 11 som scanner et begrenset område 12. Posisjonsmåleenheten 3 registrerer sin egen posisjon, og derved sensorens 1 posisjon, relativt til et nettverk 8 av referansepunkter 9. Referansepunktene 9 er kjent relativt til det globale koordinatsystemet 13.

20 Systemet inneholder videre en regneenhet 5 som samler inn dataene fra scannerenheten 2 og posisjonsmåleenhet 3 og transformerer alle data fra scannerenheten til samme globale koordinatsystem. Regneenheten 5 sender også informasjon til roboten 4 for kontroll av dennes forflytning relativt til objektet.

25 Figur 2 viser en alternativ konfigurasjon. Referansepunktene 9 er her anbragt på objektet 6. Posisjonsmålesensoren 3 er anbragt slik at den ser disse referansepunktene.

Scannerenheten 2 kan eksempelvis være en av følgende typer, men er ikke begrenset til dette:

30

- Laser avstandsmåler som måler avstanden mellom scannerenhet og objektet i ett punkt,
- Trianguleringssensor basert på én-akse scannende laser eller laser linjeproeksjon kombinert med kamera (f.eks. CCD sensor). En slik sensor scanner en linje i hver posisjon av scanneren.
- 35 • Trianguleringssensor basert på to-akse scannende laser eller laser raster proeksjon kombinert med kamera (f.eks. CCD sensor).

- Sensor basert på projeksjon av mønster kombinert med ett eller flere kamera (f.eks. CCD sensor).

Figur 3 viser prinsippet for en trianguleringssensor. Denne inneholder en laser 14 som
5 utsender en laserstråle 11 eller et laser plan (linjeprojeksjon). Laseren projiserer et
punkt 15 eller en linje på objektet 6. Punktet 15 avbildes gjennom en linse 16 på en
sensor 17, eksempelvis et CCD array. Scannerenheten 2 er kalibrert, slik at den
bestemmer punktets 15 posisjon relativt til et internt koordinatsystem 18. I en
alternativ utforming kan laserstrålen rettes inn mot flaten via et to-akset, bevegelig
10 speil. Derved kan et område av flaten scannes fra en posisjon av
trianguleringssensoren.

Scannerens vesentlige egenskap er at den registrerer lokal geometri for et objekt,
relativt til scannerens interne koordinatsystem. For hver posisjon av scanneren kan
15 man registrere et punkt, punkter langs en linje, eller punkter i et to-dimensjonalt
mønster.

Posisjonsmåleenheten 3 er fortrinnsvis av type beskrevet i norsk patent nr. 303.595,
som vist i figur 4. Denne består essensielt av et eller flere kamera montert sammen i
20 en enhet. Det enkelte kamera ser et referansemønster i form av punkter, linjer eller lett
gjenkjennbare objekter. For hver posisjon av sensorenheten 1 avbildes punktene 9 i
referansemønsteret 8 gjennom linsen 19 på sensoren 20. Dataene overføres til
regneenheten 5. Programvare i regneenheten sørger for beregning av posisjonsmåle-
enhetens 3 egen posisjon og orientering relativt til referansemønsteret 8.
25 Posisjonsmåleenheten i figur 4 er også vist med håndtak 21 og aktiviseringsbryter 22
for manuell bruk. Videre er vist belysningskilde 23 for belysning av referanse-
mønsteret 8, og mekanisk probe 24 for punktvis måling av et objekt ved berøring, som
beskrevet i norsk patent nr. 303.595.

30 Det vil være fordelaktig om referansemønsteret 8 er kjent i objektets koordinatsystem
eventuelt er en del av objektet selv som angitt i figur 2. Dette kan oppnås om objektet
har hull som kan gjenkjennes av posisjonsmåleenheten, eller om referansemønsteret
festes til objektet, f. eks. ved å sette lett gjenkjennelige targets i hull eller
fordypninger i objektet. Disse targets kan f.eks. være rene passive markører, lysgivere,
35 lysreflektorer e.l.

Det er vesentlig at den geometriske relasjonen mellom scannerenheten 2 og
posisjonsmåleenheten 3 er kjent og stabil. Dette kan delvis oppnås ved en stabil,

presis og kjent mekanisk konstruksjon, og eventuelt ved separat kalibrering som angitt nedenfor.

5 Robotenheten 4 har som eneste oppgave å posisjonere sensorenheten 1 i riktig posisjon og orientering relativt til objektet 6. Flere typer robotprinsipper kan benyttes, eksempelvis arm-roboter, kartesiske roboter, roboter med én, to, tre eller flere frihetsgrader. Roboten kan styres etter et forhåndsbestemt program, eller ved å benytte den registrerte posisjonen av sensorenheten relativt til objektet, og gi roboten instruksjoner om relativ forflytning relativt til nåværende posisjon.

10

For hver posisjon skal dataene fra sensorenheten 1 relateres til det samme globale koordinatsystem 13. Dette forutsetter at relasjonen mellom scannerehetens koordinatsystem X_s, Y_s, Z_s , og posisjonsmåleenhetens koordinatsystem X_c, Y_c, Z_c er kjent. Figur 5 illustrerer en metode for å bestemme denne relasjonen. Sensorenheten 1
15 posisjoneres slik at minst tre referansepunkter 9 er innenfor dens måleområde. Ved å registrere posisjonen av referansepunktene relativt til scannerenhetens koordinatsystem, samtidig som posisjonsmåleenheten registrerer sin posisjon relativt til referansepunktene, tilveiebringes informasjonen som er nødvendig for å beregne transformasjonen mellom de to koordinatsystemene.

20

P a t e n t k r a v

1.

System for deteksjon av et objekts (6) overflategeometri, bestående av en sensorenhet
5 (1) med utstyr (2) for lokal, punktvis deteksjon av overflategeometri, samt en
robotenhet (4) for forflytning av sensorenheten (1), k a r a k t e r i -
s e r t v e d at det i sensorenheten (1) inngår en optisk scanner-enhet (2)
for kontaktfri avføling og deteksjon av objektets overflategeometri, og en
posisjonsmåleenhet (3) innrettet for å bestemme sensorenhetens (1) egen posisjon i et
10 globalt koordinatsystem gitt av et nettverk (8) av referansepunkter (9) i kjente
posisjoner, og at en regneenhet (5) er tilveiebrakt og innrettet for innsamling av data
fra scannerenheten (2) og posisjonsmåleenhet (3) og for transformasjon av dataene fra
scannerenheten (2) slik at de relateres til det globale koordinatsystemet.

15 2.

System som angitt i krav 1, k a r a k t e r i s e r t v e d at
robotenheten (4) er innrettet for trinnvis forflytning av sensorenheten (1).

3.

20 System som angitt i krav 1, k a r a k t e r i s e r t v e d at
posisjonsmåleenheten (3) består av en kamerabasert sensor (7) og at denne er innrettet
for avbildning av et nettverk (8) bestående av referansepunkter (9) i kjente posisjoner.

4.

25 System som angitt i krav 1, k a r a k t e r i s e r t v e d at
nettverket (8) av referansepunkter (9) er på objektet, og
at posisjonen for de enkelte referansepunktene i nettverket er kjent relativt til et
objektfast koordinatsystem.

30 5.

System som angitt i krav 1, k a r a k t e r i s e r t v e d at
robotenheten (4) er innrettet til skrittvis å bevege sensorenheten (1) over objektet (6).

6.

35 System som angitt i ett eller flere av foregående krav, k a r a k t e r i -
s e r t v e d at scannerenheten (2) er valgt fra gruppen bestående av:
laserscanner, ett-punkts laser avstandsmåler, laserbasert trianguleringssensor
kombinert med kamera, trianguleringssensor med to-akse scannende laser,

trianguleringssensor med laser rasterprojeksjon i kombinasjon med kamera, sensor basert på mønsterprojeksjon kombinert med minst ett kamera.

7.

5 System som angitt i ett eller flere av foregående krav, k a r a k t e r i -
s e r t v e d at robotenheten (4) er valgt fra gruppen bestående av
armbasert robot, kartesisk robot, robot med én, to eller flere frihetsgrader,
programstyrt robot, sanntids posisjonsstyrt robot basert på registrert posisjons av
sensorenheten (1) i forhold til objektet og instruksjon om forflytning i forhold til
10 eksisterende posisjon.

8.

System som angitt i ett eller flere av foregående krav, k a r a k t e r i -
s e r t v e d at nevnte kamera i posisjonsmåleenheten (3) er et CCD
15 kamera.

9.

System som angitt i krav 4, k a r a k t e r i s e r t v e d at
referansepunktene (9) utgjøres av hull eller fordypninger i objektets (6) overflate.
20

10.

System som angitt i krav 4 eller 9, k a r a k t e r i s e r t v e d
at referansepunktene (9) utgjøres av såkalte "target" plassert på objektet (6) eller i
nevnte hull eller fordypninger i objektets (6) overflate.
25

11.

Fremgangsmåte for deteksjon av et objekts (6) overflategeomtri, der det anvendes en
sensorenhet (1) med utstyr (2) for lokal, punktvis deteksjon av overflategeomtri, en
posisjonsmåleenhet (3) for å bestemme sensorenhetens egen posisjon i et globalt
30 koordinatsystem i forhold til et nettverk (8) av referansepunkter (9) i kjente
posisjoner, samt en robotenhet for forflytning av sensorenheten (1), k a r -
a k t e r i s e r t v e d at sensorenheten (1) posisjoneres slik at en
del av objektets (6) overflate er innenfor scannerenhetens (2) måleområde, at nevnte
område scannes, at posisjonsmåleenheten (3) samtidig bestemmer posisjonen av
35 sensorenheten (1) relativt til nettverkets (8) koordinatsystem, at dataene fra
scannerenheten (2) overføres til en regneenhet (5) der de transformeres til nettverkets
(8) koordinatsystem og lagres.

12.

Fremgangsmåte som angitt i krav 11, k a r a k t e r i s e r t
v e d at sensorenheten (1) forflyttes stegvis av robotenheten (4).

5 13.

Fremgangsmåte for kalibrering av en sensorenhet (1) som inneholder utstyr (2) for lokal, punktvis deteksjon av overflategeometri og en posisjonsmåleenhet (3) for å bestemme sensorenhetens egen posisjon i et globalt koordinatsystem i forhold til et nettverk (8) av referansepunkter (9) i kjente posisjoner, og der sensorenheten (1) er
10 montert på en robotenhet (4) for forflytning relativt til et objekt (6) k a r -
a k t e r i s e r t v e d at sensorenheten (1) posisjoneres slik at
minst ett av referansepunktene (9) er innenfor scannerenhetens (2) måleområde, at referansepunktets (9) posisjon relativt til scanneren (2) bestemmes, og at posisjonsmåleenheten (3) samtidig bestemmer posisjonen av sensoren (1) relativt til
15 nettverkets (8) koordinatsystem, at dette gjentas til posisjonen av minst tre referansepunkter (9) er bestemt relativt til scannerenhetens koordinatsystem, at det på basis av dataene registrert av scannerenheten (2) og posisjonsmåleenheten (3) beregnes en transformasjonsmatrise som beskriver relasjonen mellom de to enhetenes koordinatsystemer.

Sammendrag.

System for deteksjon av et objekts (6) overflategeometri, bestående av en sensorenhet (1) med utstyr (2) for lokal, punktvis deteksjon av overflategeometri, samt en robotenhet (4) for forflytning av sensorenheten (1). I sensorenheten (1) inngår en optisk scanner-enhet (2) for kontaktfri avføling og deteksjon av objektets overflategeometri, og en posisjonsmåleenhet (3) innrettet for å bestemme sensorenhetens (1) egen posisjon i et globalt koordinatsystem gitt av et nettverk (8) av referansepunkter (9) i kjente posisjoner. En regneenhet (5) er tilveiebrakt og innrettet for innsamling av data fra scannerenheten (2) og posisjonsmåleenhet (3) og for transformasjon av dataene fra scannerenheten (2) slik at de relateres til det globale koordinatsystemet.

Videre foreligger en fremgangsmåte for deteksjon av objektets (6) overflategeometri og en fremgangsmåte for kalibrering av sensorenheten (1).

Fig. 1.

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

LANGFELDT, Jens, F., C.
Bryns Zacco AS
P.O. Box 765
Sentrum
N-0106 Oslo
NORVÈGE

Date of mailing (day/month/year) 27 March 2001 (27.03.01)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference E14443 JFL/JB	
International application No. PCT/NO00/00235	International filing date (day/month/year) 10 July 2000 (10.07.00)

1. The following indications appeared on record concerning:									
<input type="checkbox"/> the applicant	<input type="checkbox"/> the inventor <input checked="" type="checkbox"/> the agent <input type="checkbox"/> the common representative								
Name and Address LANGFELDT, Jens, F., C. Bryns Patentkontor A/S P.O. Box 765 Sentrum N-0106 Oslo Norway	<table border="1"> <tr> <td>State of Nationality</td> <td>State of Residence</td> </tr> <tr> <td colspan="2">Telephone No. 229 10 400</td> </tr> <tr> <td colspan="2">Facsimile No. 229 10 500</td> </tr> <tr> <td colspan="2">Teleprinter No.</td> </tr> </table>	State of Nationality	State of Residence	Telephone No. 229 10 400		Facsimile No. 229 10 500		Teleprinter No.	
State of Nationality	State of Residence								
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<input type="checkbox"/> the person	<input checked="" type="checkbox"/> the name <input type="checkbox"/> the address <input type="checkbox"/> the nationality <input type="checkbox"/> the residence								
Name and Address LANGFELDT, Jens, F., C. Bryns Zacco AS P.O. Box 765 Sentrum N-0106 Oslo Norway	<table border="1"> <tr> <td>State of Nationality</td> <td>State of Residence</td> </tr> <tr> <td colspan="2">Telephone No. 229 10 400</td> </tr> <tr> <td colspan="2">Facsimile No. 229 10 500</td> </tr> <tr> <td colspan="2">Teleprinter No.</td> </tr> </table>	State of Nationality	State of Residence	Telephone No. 229 10 400		Facsimile No. 229 10 500		Teleprinter No.	
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3. Further observations, if necessary:									
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PATENT COOPERATION TREATY

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From the INTERNATIONAL BUREAU

NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

To:

LANGFELDT, Jens, F., C.
Bryns Patentkontor A/S
P.O. Box 765
Sentrum
N-0106 Oslo
NORVÈGE

Date of mailing (day/month/year) 01 November 2000 (01.11.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference E14443 JFL/JB	
International application No. PCT/NO00/00235	
International publication date (day/month/year) Not yet published	
International filing date (day/month/year) 10 July 2000 (10.07.00)	Priority date (day/month/year) 13 July 1999 (13.07.99)
Applicant METRONOR ASA et al	

- The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
- This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
- An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
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<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
13 July 1999 (13.07.99)	19993446	NO	12 Octo 2000 (12.10.00)

The International Bureau of WIPO
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